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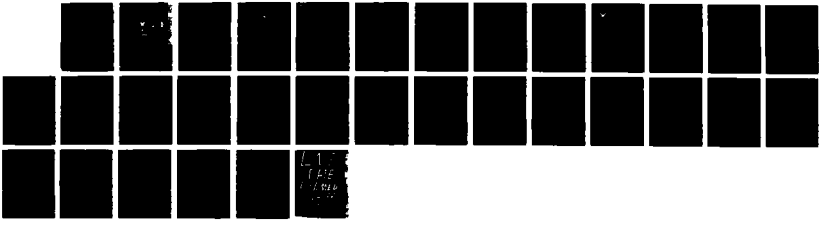

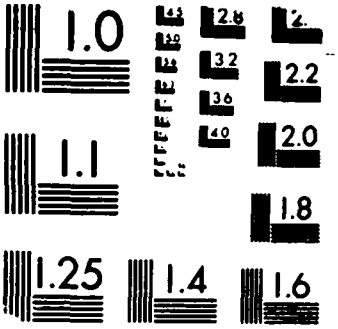

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STUDENT REPORT

TACTICAL AIR FORCES NIGHT TRAINING

MAJOR JAMES V. STEWART 88-2490

"insights into tomorrow"

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REPORT NUMBER 88-2490

TITLE TACTICAL AIR FORCES NIGHT TRAINING

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Submitted to the faculty in partial fulfillment of
requirements for graduation.

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The TAF will soon acquire new weapons systems with increased night employment capabilities. To effectively employ these new systems will require an increase in night flying training. This study examines the quantity and quality of current TAF night flying training and identifies and discusses the problems associated with an increase in night flying training requirements.

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PREFACE

The US Air Force is enhancing its night employment capability by the acquisition of new weapons systems, but to effectively employ those systems, and to respond to a growing Soviet night threat, an increased level of night flying training is required. Such an increase entails difficulties, however, and this report will examine some of the problems to be dealt with when implementing an increase in night flying training requirements. The report will also provide the results of research designed to quantify the quality of current night tactical flying training.

The author wishes to thank several individuals for their invaluable support in the completion of this project. Many thanks to Major Rod Hazen for his sponsorship in this effort. Also, a debt of gratitude to the faculty advisor, Major Ron Dufresne, for his patience, constructive editorial advice, and dedication to excellence. Finally, special thanks to Colonel A.K. Smith, 36th TFW/DO, for his support in conducting the research.

ABOUT THE AUTHOR

MAJOR JAMES V. STEWART

Major Stewart received a Bachelor of Science degree in Business Administration from the University of South Carolina and was commissioned through the university's Air Force Reserve Officer Training Corps program in May 1973.

He graduated from Undergraduate Pilot Training at Craig Air Force Base, Alabama in November 1974 and was first assigned to the 49th Fighter Interceptor Squadron at Griffiss Air Force Base, New York. Major Stewart flew the T-33 from January 1975 to February 1976. He then flew the F-106 from March 1976 to August 1981. While at Griffiss, he served as Life Support Officer, Instructor Pilot, Chief of Training, and Chief of Weapons and Tactics. In 1979, he graduated from the USAF Interceptor Weapons School, and in 1980 was the 49th Fighter Interceptor Squadron William Tell Team Captain.

In 1981 Major Stewart was assigned to Headquarters Air Defense, Tactical Air Command, Langley Air Force Base, Virginia, where he was a Training Branch, and Weapons and Tactics Branch Staff Officer. In addition to augmenting the MAJCOM Standardization and Evaluation Team as an F-106 Flight Examiner, Major Stewart was one of the eight USAF and Canadian Forces primary action officers who wrote, rewrote, staffed, and coordinated Joint Regulation 55-79, Aircrew/ Weapons Controller Procedures for Air Operations.

From September to December 1984 Major Stewart attended F-15 transition training at Luke Air Force Base, Arizona and was assigned to the 525th Tactical Fighter Squadron at Bitburg Air Base, Germany from January 1985 to August 1987. While at Bitburg, he served as Maintenance Liaison Officer, Safety Officer, and Wing Weapons and Tactics Officer.

Major Stewart is a Senior Pilot with over 2700 hours of flying time in the T-33, F-106, and F-15 as a flight lead, instructor pilot, special mission commander, and flight examiner. He received a Master of Science in International Relations from Troy State University - Europe in 1988. Major Stewart completed Squadron Officers School by correspondence in 1977, Air Command and Staff College by seminar in 1983, and is currently attending Air Command and Staff College in residence.

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EXECUTIVE SUMMARY

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REPORT NUMBER 88-2490

AUTHOR(S) MAJOR JAMES V. STEWART, USAF

TITLE TACTICAL AIR FORCES NIGHT TRAINING

I. Problem: Future Tactical Air Forces (TAF) aircraft will have significant night employment capability, and to successfully exploit this capability, TAF aircrews will need to train more at night. Current night flying training requirements are minimal, and the quality of that training is limited by airspace restrictions and training Rules of Engagement (ROE). Additionally, an increase in night flying training requirements will be influenced by airspace restrictions, training ROE, maintenance factors, and personnel and support issues.

II. Objectives: This study has two overall main objectives: to examine the quantity and quality of night flying training currently being flown by TAF units, and to identify the problems associated with an increase in night flying training requirements for TAF aircrews. The quantity is obtained by a review of applicable tasking documents and training records. The quality of night flying training is evaluated through an examination of restrictions to training with respect to airspace and ROE, and by a data search of flight records compared with sunset times.

III. Discussion of Analysis: Joint Regulation (JR) 55-79 was used as the source for training ROE, and Tactical Air Command Manual (TACM) 51-50 was used as the source for semi-annual flying training requirements. Host-nation letters of agreement from Germany's Central Region were used to identify airspace restrictions in Europe. The data search for individual night accomplishments was done using a small sample from a single, but representative, tactical fighter wing due to the difficulty in retrieving data from current tracking systems. Other factors impacting an increase in night flying training were identified but not discussed in great depth due to the scope of this project.

IV. FINDINGS: This project revealed several findings:

- Current data tracking systems make extraction of night flying training information difficult.
- A representative but small sample indicates that most night tactical flying training is being done in conditions of darkness.
- Only two night sorties are currently required per training half, although night event requirements are being increased.
- Night training airspace in Central Germany is extremely limited by host-nation rules, and restricts both the quantity and quality of training available.
- Numerous factors such as flying hour funding, maintenance capability, crew rest, base support activities, and family issues must be addressed when increasing night flying training requirements.

V. RECOMMENDATIONS: The research suggests the following recommendations:

- Implement a modified tracking and data retrieval system in order to fully validate and monitor the quality of night flying training done by TAF aircrews.
- In order to support increased night flying training, obtain additional airspace and remove restrictions which unnecessarily limit the quality and quantity of training.

VI. CONCLUSIONS: This study has shown that the quantity of TAF night flying training required is minimal, and the quality of that training is limited by available airspace and training ROE. Numerous sources report the need to employ TAF aircraft at night and to train to that end. Both current and new systems must compete for airspace and flying hours. Increases in current night flying training requirements must be fully evaluated and all relevant factors considered. This study has been an effort to identify some of those factors and provide insight into the status of current night flying training programs.

Chapter One

TACTICAL AIR FORCES NIGHT TRAINING

INTRODUCTION

The US Air Force is expanding its nighttime employment capability with the introduction of new systems such as the F-15E Strike Eagle, the Advanced Tactical Fighter (ATF), and Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) pods. Additionally, new generation Soviet aircraft such as the MIG-29 Fulcrum and SU-27 Flanker have an expanded night capability and Soviet training continues to reinforce a night employment doctrine (13:1). Therefore, the Tactical Air Forces' (TAF) ability to effectively utilize these new capabilities and counter a more capable Soviet threat will require its aircrews and support personnel to increasingly operate in conditions of darkness. Current training programs, however, include only limited night training requirements, use restrictive training rules of engagement (ROE), and do not require actual conditions of darkness for the accomplishment of many training events.

These new systems require extensive training under conditions of actual darkness to effectively utilize system capabilities. This study will evaluate both the current quality and quantity of actual night training in order to provide a point of departure for the establishment and evaluation of future training goals. Given that new systems will require an increased level of night training, this study will attempt to identify and examine the various impacts of an increased night training program. This analysis will provide data to decisionmakers which has not been previously quantified, and which can be used to make informed decisions on future training programs.

OVERVIEW

Chapter Two will define night sorties and associated night training events in accordance with Tactical Air Command (TACM) 51-50, Tactical Aircrew Training. A listing of current night training requirements will also be provided for several specific TAF weapons systems. Training rules of engagement (ROE) as specified in Joint Regulation (JR) 55-79,

Aircrew/Weapons Controller Procedures for Air Operations, will be discussed as they enhance or detract from anticipated wartime employment. Finally, types of night missions that might be anticipated during wartime will also be discussed.

Chapter Three will discuss and summarize the results of a data search of night flying training accomplished by a typical Tactical Fighter Wing (TFW). Due to the limited scope of this Air Command and Staff College (ACSC) project, the 36th TFW at Bitburg AB, Germany was selected as a representative TAF unit. However, an unexpected limitation to the data gathering process further limited the data available for this report. This limitation will also be explained.

Chapter Four will examine the potential impact and conflicts in airspace availability given an increase in night training requirements using Air Traffic Control (ATC), Federal Aviation Administration (FAA), and host-nation agreements (in Europe's Central Region) as sources. In addition to airspace requirements, Chapter Four will also identify other areas for consideration such as: crew rest, base support, maintenance capability, and family issues which would be affected by an increase in night flying training.

Finally, Chapter Five will provide findings, recommendations, and conclusions based on an analysis of the data obtained and the various factors examined.

Chapter Two

REQUIREMENTS AND RULES OF ENGAGEMENT

Both TACM 51-50 and JR 55-79 identify and define TAF missions. JR 55-79 divides those missions into Air-to-Air Operations and Air-to-Ground Operations, and Tactical Air Command Regulation (TACR) 55-50, Night Flying for All TAC Aircrews, establishes the requirement to train for night employment. This chapter will examine the training for those missions and will use JR 55-79 as its primary source to identify training ROE and TACM 51-50 as the primary source for training event definitions and requirements.

Air-to-air operations which are addressed in JR 55-79 are categorized into two major component missions: counter-air and aerospace defense. Night air-to-surface operations tasked by TACR 55-50 include: air reconnaissance (RECCE), suppression of enemy air defenses (SEAD), and interdiction.

Training to perform those missions is accomplished by a three-pronged method involving academic ground training, simulator and part-task trainer missions, and actual flying training. TACR 55-50 "... establishes the requirement for ... operational squadrons to plan and conduct night continuation training programs so that a basic level of night proficiency and capability is maintained in the mission assigned to each squadron" (7:1). TACM 51-50 prescribes the semi-annual training program for each weapon system and defines the missions and events required to maintain Mission Ready (MR) status.

TACM 51-50, Volume 1, Table 3-1 establishes the minimum semi-annual basic flying requirements for all tactical aircraft and includes the requirement for two night sorties per aircrew per training half. "A night sortie is one on which either takeoff or landing and at least 60 percent of flight duration or one hour flight time, whichever is less, occur during official hours of darkness" (5:3-2). The remainder of night flying training requirements are specified by each MAJCOM in their respective Chapter 6 to TACM 51-50.

Specific night, semi-annual flying training event requirements for TAC and USAFE aircrews by weapon system are shown in Table 1. All units are required to fly at least two night sorties and one night air refueling per training half.

Additionally, air-to-air tasked units are required to perform a minimum number of night intercept events, and air-to-surface tasked units are required to perform a minimum number of night weapons delivery events. The importance of night employment of tactical assets in theater warfare at many levels (such as the use of F-111F aircraft in the Libyan strike) has prompted USAFE to increase night training requirements for strike aircraft in CY 88 to include three additional night low levels and four additional night laydown/loft deliveries (11:1).

Training to employ at night requires a logical balance of risk versus gain. TACR 55-50 stresses a building block approach to the night training program combined with an emphasis on safety and supervisory involvement (7:3). In order to provide guidance for the safe conduct of flying training, JR 55-79 specifies training ROE for night flying training and states that "night operations are those taking place between official sunset and official sunrise" (4:9-3). Only intercepts are authorized for night air-to-air training since air combat training (ACBT) ROE requires a clearly discernable horizon (4:9-4).

Other differences between rules to train in daylight and rules to train at night exist. A summary of applicable JR 55-79 training ROE as it differs from day/Visual Flight Rules (VFR) ROE is listed below:

- ...No visual 'Commits'/'Judys' are authorized by aircrew under night/IMC operation.
- ...To meet wartime training objectives, adversaries may operate without exterior lighting at night with the approval of wing/air division commander(s) and in a MAJCOM-approved airspace providing an appropriate waiver to applicable directives has been obtained.
- ...Two-way communications will be required at all times for blacked-out operations.
- ...The minimum vertical separation between participating aircraft inside 10 NM with no visual contact is 1,000 feet.
- ...An MSA [minimum safe altitude] will be established 500 feet above the highest obstacle for the operation area, sub-area, or route.... Aircrews may descend below the established MSA only when visual reference is established and can be maintained with the terrain or obstacles. Any time visual reference with the terrain or obstacles is lost, the aircrews will return to a safe altitude at or above the MSA... (4:9-3 - 9-4).
- ...Minimum altitude for all USAFE aircraft (except F-111 aircraft using TFR) participating in night intercepts is 2,500 feet AGL. F-111 target aircraft

operating below 5,000 AGL will observe normal TFR system limitations (10:7).

These rules represent a compromise between the actual wartime employment environment and the acceptable risks that must be taken when training to fight in that wartime arena. JR 55-79 training ROE is at times waived in pursuit of specific operational peacetime objectives. A recent example of such waiver is the modification of JR 55-79 ROE during the conduct of TAC Project 86W-010F, TD&E of F-15 Night/Adverse Weather Air-To-Air Employment. These modifications included:

- All external lighting could be off except those that would be useful in an aerial combat zone to maintain relative position (example: strip lighting only) while in restricted airspace.
- Air-to-Surface aircraft using TFR were authorized to operate down to 1,000 feet AGL.
- Blue fighters were permitted to continue radar attacks on Red air-to-surface fighters during their weapons deliveries. Weapons delivery profiles were planned and executed for level releases (6:A-1).

The additional risks involved in conducting the TD&E with less restrictive ROE allowed the participating crews to better evaluate the TAF's capability to employ at night under conditions more closely resembling the wartime environment. The final report of that TD&E concludes:

> Pilots require more demanding and frequent night training than is currently directed to gain and maintain proficiency in four-ship operations against multi-aircraft air-to-air/air-to-surface adversary forces in the night/adverse weather environment (6:vi).

Training ROE is a necessary part of maximizing available resources to preclude the unnecessary loss of both crews and aircraft which impacts both training assets and real-world employment capabilities.

The TAF will employ at night in a variety of missions, however, as described above, there are limitations on night training ROE, and the amount and complexity of required training. The next chapter will provide more insight into how well and how much TAF aircrews train to employ at night.

BASIC REQUIREMENTS FOR ALL AIRCRAFT:

Total Night Sorties - 2
Night Air Refueling - 1
Night Landings - 2

NIGHT CURRENCIES:	Inexp.	Exper.	Notes
Night Air Refueling	15 months	15 months	
Night Landing	15 days	30 days	1
Night Tactical Sortie	60 days	90 days	2
Night Weapons Delivery	30 days	60 days	3
Night Toss Delivery	60 days	90 days	
IMC/Night TFR	21 days	21 days	4
Night TFO/CS	15 days	15 days	5

AIRCRAFT SPECIFIC REQUIREMENTS:

AIRCRAFT	EVENT (Note 6)	GCC A	GCC B	GCC C
RF-4	Night/Radar Low Level	3S	4S	4S
	Simulated Ngt/Rdr LL	8S	10S	12S
F-15	Night/Wx Intercepts	10E	15E	15E
F-16	Night Intercepts	4E	5E	6E
(USAFE)	Night Laydown/Loft	4E	4E	4E
F-111E/F	Night TFD	2E	2E	4E
	Night/IMC Auto TFR	3E	4E	5E
	Night Formation	2E	2E	2E
	Night Formation Appch	2E	2E	2E
F-111F	Pave Tack Ngt Laser Toss	4E	4E	4E

NOTES:
1. Update with day landing
2. Only for air-to-surface missions
3. Climbing, level, or diving deliveries
4. Accomplish AUTO TFR event
5. Accomplish TFO/CS event
6. E = event; S = sortie

All information extracted from TACM/USAFEM 51-50, Volume 1, and TAC and USAFE Chapter 6

Table 1. TAF Semi-Annual Night Training Requirements

Chapter Three

QUALITY OF TRAINING

The previous chapter listed night flying training requirements and the ROE that is currently used in training. This chapter will examine the quality of that night flying training. One of the primary goals of this study was to quantify the amount of night training required IAW TACM 51-50 performed during conditions of actual darkness.

Conditions of actual darkness are not required to fulfill some night training requirements. A night air refueling event can be flown under "field grade conditions", i.e., taking off before or just after official sunset, going directly to the air refueling track, getting an immediate hookup ten minutes after sunset while at 28,000 feet, and legally logging a night refueling while in near daylight conditions. Due to 55-series requirements to make all night recoveries IFR (8:3-7), a significant portion of a night sortie may be spent navigating to and from the training area and in the instrument recovery pattern. These examples are not meant to minimize the value of navigation and instrument flying training gained while flying at night, but are intended to highlight the need to fully evaluate our night training programs.

The method originally selected to obtain the data for this analysis was to access the Air Force Operations Resource Management System (AFORMS). By searching for sorties during which the aircrews logged night time or night events, and comparing the takeoff (or landing) times to official sunset (or sunrise), the percentage of time flown during darkness could be determined. Accepted limitations to the study were the effects of available moonlight, lighting conditions affected by clouds, altitudes at which training was accomplished, and percentages of tactical versus basic proficiency training. A condition of darkness was assumed to exist during activity that occurred 30 minutes or more after official sunset, or up to 30 minutes before official sunrise.

However, after research began, a serious limitation was discovered in the collection of data: AFORMS did not have the capability to recover the desired data. An examination was then made of the Core Automated Maintenance System (CAMS) data system which also lacked the ability to gather the

desired data. AFORMS only stores dates, training events, and types of flying accomplished (i.e., weather time or night time) but does not store takeoff or landing times. The CAMS system does not record training events, types of training, or correlate any of the data to specific aircrews. A workaround was discovered with the help of 36th TFW flight records personnel: AFORMS could be accessed to provide the dates on which any given aircrew logged night time. Then the aircrew's Air Force Technical Order (AFTO) Form 369 for each of those days could be manually checked to provide the takeoff and landing times for each of his night sorties. These times could be compared with meteorological tables which define official sunset and sunrise for a particular location (3:1-9 - 1-12). As this turned out to be a very labor intensive, time consuming process, an alternative method was used to gather data for this project.

The compromise was to recognize the time and expense of collecting the desired data within the context of the ACSC research program and to significantly restrict the sample group size.

Because of the difficulty in gathering the data and the time consumed conducting the manual records search, a single fighter wing, the 36th Tactical Fighter Wing at Bitburg AB, Germany, was used for the data base. A representative sample from each of the wing's three squadrons was selected which consisted of: the Squadron Commander, one squadron instructor pilot, two experienced non-IP's, and two inexperienced pilots. Selection of the individuals within the classes was random, except, of course, for the squadron commander. An additional criteria was that each selected pilot had to have been present for the entire training half. Wing attached pilots were excluded from the selection. Although the sample size of eighteen from a population size of ninety may not be statistically sufficient, it does give a representative picture of a typical F-15 wing and shows the potential value of implementing a more thorough tracking system.

Tables 2, 3, and 4 summarize the results of the research. They provide both individual and summary data for the selected sample squadrons. Although the sample size is small, there is no evidence to indicate that the sample would not be representative of any given F-15 wing. The data indicates that each of the selected pilots completed his required semi-annual night sorties, and that the majority of the logged night time was flown in the defined conditions of darkness. The overall average night time logged was 1.57 hours per sortie, and the overall average darkness time flown per sortie was 1.39 hours, for an overall average of 89% of night sortie flying hours flown in conditions of defined

darkness. The data also indicates that the inexperienced pilots flew as much or more of their training in darkness as the experienced or supervisory pilots.

The results of this research indicate that for this particular air-to-air F-15 wing, the majority of night, employment training is done during conditions of actual darkness, in keeping with the training philosophy in TACR 55-50 and JR 55-79 to train like we will fight. However, the current requirement to fly only two night sorties per training half represents less than five percent of the minimum sorties (42) required for an inexperienced F-15 pilot to maintain Graduated Combat Capability (GCC) Level A.

	DATE	T/O	LAND	SUNSET	NIGHT HRS	DARK HRS	%DARK NIGHT
SQ CC	11-16	1612	1750	1522	1.6	1.6	100%
	11-23	1520	1620	1524	0.8	0.4	50%
	11-30	1750	1936	1518	1.8	1.8	100%
TOTAL					4.2	3.8	79%
SQ IP	10-26	1615	1740	1607	1.4	1.0	71%
	10-28	1605	1750	1604	1.7	1.3	76%
	12-05	1500	1700	1516	1.7	1.3	76%
TOTAL					4.8	3.6	75%
EXP A	10-20	1620	1820	1619	2.0	1.5	75%
	10-23	1618	1828	1613	2.2	1.8	82%
TOTAL					4.2	3.3	78%
EXP B	10-27	1620	1800	1605	1.7	1.4	82%
	12-23	1600	1745	1517	1.7	1.7	100%
TOTAL					3.4	3.1	91%
INEXP A	11-23	1640	1845	1524	2.1	2.1	100%
	11-30	1755	1935	1518	1.7	1.7	100%
TOTAL					3.8	3.8	100%
INEXP B	10-06	1640	1750	1650	1.0	0.5	50%
	10-07	1805	1910	1647	1.1	1.1	100%
	11-30	1755	1935	1518	1.7	1.7	100%
	12-29	1433	1620	1521	1.0	0.5	50%
TOTAL					4.8	3.8	77%
SELECTED SAMPLE SUMMARY					25.2	21.4	84.5%

NOTE: DARK HOURS ARE COMPUTED USING 30 MINUTES AFTER OFFICIAL SUNSET AS THE START OF ACTUAL DARKNESS

Table 2. Squadron "1" Selected Night Sortie Data

	DATE	T/O	LAND	SUNSET	NIGHT HRS	DARK HRS	%DARK NIGHT
SQ CC	10-30	1610	1810	1600	2.0	1.8	90%
	11-23	1611	1741	1524	1.3	1.3	100%
	11-24	1652	1900	1523	2.1	2.1	100%
	12-07	1632	1847	1515	2.2	2.2	100%
TOTAL					7.6	7.4	97%
SQ IP	10-19	1624	1745	1621	1.4	0.9	64%
	11-30	1700	1800	1518	1.0	1.0	100%
	12-02	1548	1805	1517	2.3	2.3	100%
TOTAL					4.7	4.2	89%
EXP A	11-16	1836	2017	1532	1.7	1.7	100%
	11-23	1644	1844	1524	2.0	2.0	100%
	12-02	1515	1802	1517	2.8	2.3	82%
TOTAL					6.5	6.0	92%
EXP B	10-20	1620	1710	1619	0.8	0.3	38%
	11-16	1720	1920	1532	2.0	2.0	100%
	11-19	1530	1635	1529	1.1	0.6	55%
	11-23	1710	1845	1524	1.6	1.6	100%
	11-24	1700	1830	1523	1.5	1.5	100%
TOTAL					7.0	6.0	86%
INEXP A	12-02	1550	1800	1517	2.1	2.1	100%
	12-03	1615	1736	1516	1.4	1.4	100%
	12-07	1630	1830	1515	2.0	2.0	100%
TOTAL					5.5	5.5	100%
INEXP B	11-23	1640	1820	1524	1.7	1.7	100%
	11-24	1740	1940	1523	2.0	2.0	100%
TOTAL					3.7	3.7	100%
	SELECTED SAMPLE SUMMARY				35.0	32.8	93.7%

NOTE: DARK HOURS ARE COMPUTED USING 30 MINUTES AFTER OFFICIAL SUNSET AS THE START OF ACTUAL DARKNESS

Table 3. Squadron "2" Selected Night Sortie Data

	DATE	T/O	LAND	SUNSET	NIGHT HRS	DARK HRS	%DARK NIGHT
SQ CC	10-20	1705	1905	1619	2.0	2.0	100%
	10-27	1737	1915	1605	1.6	1.6	100%
TOTAL					3.6	3.6	100%
SQ IP	10-19	1545	1655	1621	0.6	0.1	17%
	11-06	1620	1750	1547	1.5	1.5	100%
	11-23	1653	1845	1524	1.9	1.9	100%
	11-24	1820	1957	1523	1.6	1.6	100%
TOTAL					5.6	5.1	91%
EXP A	08-31	1735	1900	1811	0.8	0.3	38%
	09-03	1720	1835	1805	0.5	0.0	0%
	10-26	1655	1825	1607	1.5	1.5	100%
	11-04	1545	1745	1551	1.9	1.3	68%
	11-05	1630	1815	1549	1.8	1.8	100%
	11-12	1740	1910	1538	1.5	1.5	100%
	11-30	1645	1825	1518	1.6	1.6	100%
TOTAL					9.6	8.0	83%
EXP B	08-31	1735	1850	1811	0.7	0.2	29%
	10-19	1545	1700	1621	0.7	0.2	29%
	10-22	1643	1810	1615	1.5	1.0	67%
	10-27	1745	1915	1605	1.5	1.5	100%
TOTAL					4.4	2.9	66%
INEXP A	07-20	1930	2100	1927	1.5	1.1	73%
	09-03	1940	2135	1805	1.8	1.8	100%
	12-01	1640	1910	1518	2.5	2.5	100%
	12-02	1555	1805	1517	2.2	2.2	100%
TOTAL					8.0	7.6	95%
INEXP B	08-31	1735	1850	1811	0.7	0.2	29%
	10-19	1545	1700	1621	0.7	0.2	29%
	11-15	1650	1815	1534	1.4	1.4	100%
	11-17	1800	1915	1531	1.3	1.3	100%
	11-24	1820	2000	1523	1.7	1.7	100%
TOTAL					5.8	4.8	83%
	SELECTED SAMPLE SUMMARY				37.0	32.0	86.5%

Table 4. Squadron "3" Selected Night Sortie Data

Chapter Four

AIRSPACE ISSUES AND OTHER LIMITATIONS

An increase in the number of night training sorties for TAF aircrews will create additional problems in a variety of areas. This chapter will identify and examine some of those areas which might adversely impact an expanded night training program.

Generally, the level of flying training is restricted by maintenance generation capability and flying hour funding. An increase in the total number of sorties required will involve both an increase in the utilization rate for the affected fighters and an increase in available flying hours unless a decrease in the sorties available for other (daylight) training is directed. However, a decrease in the sorties and hours devoted to daylight training might also decrease combat capability. These training mix and funding program issues are part of the numerous factors which must be addressed.

Another significant problem which surfaces when establishing additional night requirements is the necessity for more night training airspace. For CONUS-based units, the existence of "warning" and "restricted" areas does offer less complicated problems when attempting to schedule night airspace. Europe's Central Region, including both 2nd Allied Tactical Air Forces (ATAF) and 4 ATAF, presents a major obstacle in night airspace availability. The 4 ATAF area, where the majority of USAFE's fighter forces train (and would fight) does not have restricted training airspace. Airspace that is used for daily training is not available at night in the same way as it is in daytime. Certain Low Fly Routes are available for use, but are restricted by direction of travel, number of aircraft allowed, altitudes, weather, and speed. Areas for conducting night air-to-air training are extremely limited. The Low Altitude Night Intercept Areas (LANIAs) and Air Defense Exercise Areas (ADEXAs) are the only air-to-air training areas available through host-nation agreements. They are established by Letter of Agreement (LOA) and are governed by restrictive rules of engagement (ROE) which include:

- only on working days Monday through Thursday
  -- US holidays limit their use

-- not available on the numerous German holidays
- VFR only, no weather intercepts allowed
- four aircraft maximum
- GCI radio and radar control required
- single frequency radio for all aircraft
- hard assigned altitudes
- minimum altitude 2,500 ft AGL
- limited medium altitude airspace
  -- LANIAs 2,500 ft AGL to FL100
  -- ADEXAs FL200 to FL460
  -- none from FL100 to FL200 (9:--)

Scheduling of this limited training airspace will also be a problem for deconfliction. Currently, much of the training done by both USAFE and NATO aircrews during the day is done in the uncontrolled VFR airspace below FL100 (3:--). Because national rules prohibit VFR training after sunset, this option does not exist, and careful coordination is required to preclude the possibility of having more aircraft in the air than there is airspace to handle them. Additionally, since IFR recoveries are required at night, or in weather, normally available training airspace is sometimes denied by ATC when holding patterns and recovery airspace become saturated with returning flights.

Compounding the problems of an increased night flying program are the indirect, but nonetheless important factors caused by expanding day-oriented operations into increased night operations. Of immediate concern is the crew rest requirements for the aircrews. There have been numerous studies conducted to evaluate the impact of changing from day-oriented activity to night work. The circadian rhythm change effects are obvious. Obtaining restful sleep during the day is often difficult, and fatigue may become a factor. Location of the unit is also a factor, as latitude and season determine how much darkness is available during a given 24-hour period. Moreover, it is not only the aircrews who suffer from a change in schedule, but many of the support personnel involved both directly and indirectly in the generation of sorties (1:--,2:--).

One of the more obvious groups affected is the maintenance function. It is normally the swing shift (the shift immediately following the normal flying day) which performs required maintenance on non-mission capable aircraft. The mid shift then completes any remaining maintenance, and preflights the aircraft for the morning launch period. The day shift then launches and recovers aircraft and performs required maintenance between sorties. When going to a night flying period, the maintenance complex must also readjust the work schedules of required maintenance

personnel to support the flying operation. This creates many of the same problems with maintenance personnel as it does with aircrews, but in most locations, maintenance personnel are exposed to the elements, and operate with less than optimum lighting while they do their work. This can exaggerate fatigue and frustration for even the most professional maintenance unit.

Other base support agencies such as air traffic control (ATC), weather detachment, fire department, command post, fuel support (POL), transportation, supply, and supervisory personnel also have to alter their work schedules to provide required support for the night flying operation.

Finally, the issue of family disruption must be addressed. The impact that altered schedules, non-availability of one or both parents, marital stress, and other similar issues have on family life must be recognized by individuals and supervisors at all levels. Family issues alone provide enough of a challenge to justify a complete study into their effects (14:--).

This chapter has identified several of the various complications which must be considered if an increased night flying training program is to be implemented. Decisions must be made with regard to funding issues and levels of day versus night training. Competition for limited training airspace requires comprehensive planning and coordination among users. Supervisors must be aware of, and sensitive to, the personnel and family issues which result from the implementation of an expanded night flying program, and the requirement for increased support activity functions must also be considered. The following chapter will summarize the major factors, list findings from the research, and provide recommendations and conclusions.

Chapter Five

FINDINGS, RECOMMENDATIONS, AND CONCLUSIONS

This chapter will summarize the results of this research project and provide findings, recommendations, and conclusions. Chapter Two defined terms, examined training ROE, and listed night flying training requirements. Chapter Three explained the process and results of a limited data search intended to examine the quality and quantity of night flying training flown by a typical TAF unit. Chapter Four identified airspace, logistics, and personnel related issues.

FINDINGS

The overall purpose of this study has been two-fold: to attempt to examine the quantity and quality of night flying training currently being flown by TAF units, and to identify problems associated with an increase in night flying training requirements for TAF aircrews. The analysis revealed several findings:

- Extracting data from current tracking systems in order to evaluate the quality of night flying training required extensive manual effort.
- Although only a small sample was examined, the evaluation of the limited data indicates TAF units are meeting their night flying training requirements, and in doing so are flying the majority of each night training sortie during conditions of darkness.
- Currently, only two night sorties are required for TAF fighter crews per training half, although some night requirements are now being increased by MAJCOMs. However, it should be recognized that night employment training is also conducted in the simulator and part-task trainers and in the academic arena. This non-flying additional training serves to augment and reinforce training for which night sorties are not available.
- In Germany's Central Region, night training airspace is very limited. It is only available four days a week, and only four aircraft are allowed in the airspace at a time. This limits both the number of crews that can fly at any given time, and the complexity of that training. The requirement for GCI close control does not allow for training for degraded or autonomous operations.
- Other factors that should be evaluated when

considering an expansion of the current night flying training requirements include: flying hour funding, maintenance capability, crew rest, base support activities, and family issues.

RECOMMENDATIONS

In response to the above findings, the following recommendations are made:

- Conduct a more thorough examination of the percentage of night sorties and events flown during actual darkness. Although there is no reason to view the sample data as unrepresentative, an easy method exists to collect complete data if implemented at the beginning of a training half. A simple log could be filled out by each crew after all night sorties indicating takeoff and landing times, and official sunset (or sunrise). This data could then be entered into squadron level computers by 271XX personnel for later retrieval and evaluation.
- Obtain additional night training airspace, and remove restrictions which unnecessarily limit the quality of night flying training.
  - -- Change minimum altitude to 1,000 ft AGL or MSA whichever is higher.
  - -- Allow more than four aircraft to use the same airspace at the same time as long as altitude deconfliction is maintained.
  - -- Delete the requirement for a single controller and single frequency and allow dual frequency operation.
  - -- Allow altitude blocks instead of hard altitudes to develop and improve employment tactics.

CONCLUSIONS

In conclusion, this study has shown that the quantity of TAF night flying training required is minimal, and the quality of that training is limited by available airspace and training ROE. Numerous sources report the need to employ TAF aircraft at night and to train to that end. Both current and new systems must compete for airspace and flying hours. Increases in current night flying training requirements must be fully evaluated and all relevant factors considered. This study has been an effort to identify some of those factors and provide insight into the status of current night flying training programs.

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GLOSSARY

ACBT	Air Combat Training
ACSC	Air Command and Staff College
ADEXA	Air Defense Exercise Area
AFORMS	Air Force Operations Resource Management System
AFTO	Air Force Technical Order
AGL	Above Ground Level
ATAF	Allied Tactical Air Force
ATC	Air Traffic Control
ATF	Advanced Tactical Fighter
CAMS	Core Automated Maintenance System
CONUS	Continental United States
CY	Calendar Year
FAA	Federal Aviation Administration
FEBA	Forward Edge of the Battle Area
FL	Flight Level
GCI	Ground Controlled Intercept
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IP	Instructor Pilot
JR	Joint Regulation
LANIA	Low Altitude Night Intercept Area
LANTIRN	Low-Altitude Navigation and Targeting Infrared for Night
LOA	Letter of Agreement
MAJCOM	Major Command
MR	Mission Ready
MSA	Minimum Safe Altitude
MSL	Mean Sea Level
NAF	Numbered Air Force
NATO	North Atlantic Treaty Organization
NTFD	Night Terrain Following Delivery
POL	Petroleum, Oil, and Lubricants
RECCE	Reconnaissance
ROE	Rules of Engagement
SEAD	Suppression of Enemy Air Defenses
TAC	Tactical Air Command
TACM	Tactical Air Command Manual
TACR	Tactical Air Command Regulation
TAF	Tactical Air Forces
TD&E	Tactics Development and Evaluation
TFD	Terrain Following Delivery
TFR	Terrain Following Radar
TFW	Tactical Fighter Wing
USAFE	United States Air Forces Europe
USAFEM	United States Air Forces Europe Manual
VFR	Visual Flight Rules

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